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COAL FATAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

DISTRICT C

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REPORT OF FATAL COAL MINE BUMP (OUTBURST) ACCIDENT

MOSS NO. 2 MINE
CLINCHFIELD COAL COMPANY
CLINCHFIELD (P.O. DANTE), RUSSELL COUNTY, VIRGINIA

Code
0.101

December 13, 1967

by

J. L. Gilley
Mining Engineer

and

Jack E. Tisdale
Technical Assistant

Originating Office - Bureau of Mines
Norton, Virginia 24273
J. S. Malesky, District Manager
Health and Safety District C

widow & 1 James R. Bradley, Jr.

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INTRODUCTION

This report is based on an investigation made in accordance with the provisions of the Federal Coal Mine Safety Act (66 Stat. 692; 30 U.S.C. Secs. 451-483) as amended.

James R. Bradley, roof bolter and timberman, was fatally injured when he was thrown or staggered into the cutting rotor of a continuous mining machine following a coal bump or outburst. The accident occurred while mining the bleeder block (pillar) in No. 1 heading of 6 right panel off 5 west through the 7 right panel section in the Moss No. 2 Mine about 12:25 p.m., Wednesday, December 13, 1967. Bradley, age 57, is survived by his wife and 1 dependent child. He had about 38 years mining experience, the last 10 years at this mine in his present occupation. Moses Salyers, roof-bolter and timberman, received a small laceration along the right brow, and after examination by a doctor, was released.

The Norton office of the Bureau of Mines was notified of the accident by a company official about 2:00 p.m., December 13, 1967. An investigation was made the next day.

Information for this report was obtained from an examination of the section involved, including the scene of the accident which had remained undisturbed, from statements of eyewitnesses, other workmen in the section, and mine officials.

GENERAL INFORMATION

The Moss No. 2 Mine is opened by a slope and 3 shafts into the Tiller coalbed, which ranges from 30 to 89 inches in thickness, but averages 54 inches in thickness in the 7 right section. An average of 5,847 tons of coal a day was produced by the 305 underground and 32 surface employees. Coal is loaded with ripper-type continuous mining machines and conventional loading machines, which discharge into cable-reel type shuttle cars. Coal in the 7 right section was mined with a Lee-Norse, Type 32 Y continuous mining machine.

The mine is developed by a multiple-entry system and final mining of pillars is by a complete extraction method. In some areas of the mine a panel of 5 entries is developed to a predetermined limit; then the entry pillars are recovered on retreat. This system was used in the 7 right panel 5 west section where the 5 entries were driven to a depth of 2,250 feet on 75-foot centers and 20 feet in width. Crosscuts were on 75-foot centers, thus forming pillars about 55 feet square. The 7 right entries were driven parallel to the previously mined 6 right panel with a continuous pillar of coal about 55 feet thick intervening between the panels. Bleeder entries were provided for the adjacent caved areas. One row of pillars was left to protect the entry next to the solid coal in each panel and to facilitate ventilation. These pillars are locally termed "bleeder blocks" and the 2 pillars (bleeder blocks) involved in the outburst are designated as "X" and "Y" pillars, as indicated in Sketches 1 and 2 of this report.

The natural conditions in the area to the north of 5 west development, including the 4, 5, 6, and 7 right panels, were conducive to outbursts. Bursts were experienced soon after pillar extraction was started in the 5 right panel, a situation that prompted the company officials to request a re-evaluation of the pillar system in that area. Following a cooperative study by company officials and representatives of the State and Bureau of Mines, changes were made in the pillaring system and mining techniques. These changes and a concerted effort by the mining personnel to attain complete extraction, permitted the 5 and 6 right panels to be completed with a minimum of bursts of consequence. The 7 right panel was developed a predetermined distance of 2,250 feet; and the pillars, including the No. 1 entry bleeder line of pillars had retreated 1,800 feet without the occurrence of an outburst injury until the accident on December 13, 1967.

The current method of extracting the individual pillars is accomplished by mining a place or "split" 20 feet in width through the pillar from the crosscut side (Step "A"), then extracting the wings "B" and "C" in succession, as indicated in Sketch 3. When mining split "A", the face is

advanced as uniformly or evenly as practicable to minimize the stress differential during the mining processes. Pillars "X" and "Y" were to be mined in this manner. (Experience has proved that sumping the miner too deeply in the coal on either side of a stressed pillar in the 5, 6, and 7 right panels could initiate outbursts.)

The pillar-mining plan requires that the pillars be extracted individually, in succession, from right to left across the entries to establish a flat extraction line; however, the No. 1 entry bleeder block is mined in a one-block-sequence in advance of the remainder of the extraction line to permit easier detachment and sharper caving of the roof, as soon as possible, in the vulnerable pillar-line point area. From Sketch 2, it will be noted that the barrier intervening between No. 5 entry 7 right panel and the No. 1 bleeder entry of 6 right panel also had been developed, according to plan, a sufficient distance outby the extraction line to further equalize the stresses on coal pillars in the pillar-line point area (area of converging abutments).

The maximum cover overlying the 7 right 5 west bump area is 1,100 feet thick and contains intermittent stratum of sandstone ranging from a few feet up to about 60 feet in thickness. The roof, which contacted the coal in the immediate area involved, was predominately medium-grained sandstone ranging up to 25 feet in thickness and contained generous amounts of quartz; however, a localized dispositional change in the structure of the immediate roof from sandstone to an interbedding of various shales was encountered 150 feet inby the current extraction (See Sketch 1). Lenticular deposits of coal (coal rider or wild coal) ranging up to about 16 inches in thickness have been observed at horizons varying from 10 to 25 feet above the coalbed following roof falls in the pillared areas. This coal formation usually permits easy detachment of the roof and normally sharp caving occurs subsequent to complete extraction of one or two pillars in the 7 right panel; however, the two rows of pillars inby the accident area were recovered before a fall occurred. This fall occurred during the shift prior to the accident. Additional caving occurred during the interval between the accident and the investigation.

The mine floor is predominately hard, dense shale or siltstone in the 7 right section, and very little heaving of the floor was in evidence, except in the bleeder entry starting 200 feet inby the pillar involved in the accident and extending outby to the entrance to the entry. Although the floor resists plastic flow, it will heave when subjected to abnormal pressures and is affected by water.

The adopted roof support plan in the 7 right section consists of roof bolts on 4-foot centers in development and posts set on specified patterns during retreat mining. Roof bolts also are used to support the roof in mining pillar splits where required. Cribs supplemented posts at various locations. The plan appeared adequate and was followed.

The investigating committee consisted of:

CLINCHFIELD COAL COMPANY

James H. Justice	Vice President, Moss 2 and 3 Divisions
Henry Kiser	Superintendent
Willie B. Couch	Mine Foreman
Roy Evans	Assistant Mine Foreman
James Fleming	Safety Inspector
John Grubb	Engineer

UNITED MINE WORKERS OF AMERICA, LOCAL NO. 1098

Otis Collins	Safety Committeeman
Wade Scott	Safety Committeeman
Ralph Duncan	Safety Committeeman

VIRGINIA DIVISION OF MINES AND QUARRIES

Jack J. Gembach	Assistant Chief Mine Inspector
W. A. Kiser	Mine Inspector

UNITED STATES BUREAU OF MINES

J. L. Gilley	Mining Engineer
Jack E. Tisdale	Technical Assistant
M. L. West	Federal Coal Mine Inspector

The last Federal inspection of the mine was completed November 22, 1967.

DESCRIPTION OF ACCIDENT

On the day of the outburst, the 7 right panel crew, consisting of 8 workmen and a foreman, arrived on the section about 8:30 a.m. and normal production operations were begun shortly thereafter. The initial mining cycle was in the No. 1 room or crosscut in the barrier. This place had holed through during the previous shift into the No. 1 bleeder entry. After loading 1 shuttle car of coal in this place, the miner was tramped into the No. 2 room, which lacked about 25 feet being completed. Mining

in this room was completed about 11:00 a.m. and then the miner was trammed to the "X" bleeder block (scene of accident) by Earnest Bowman, the continuous miner operator.

The floor between the "X" and "Y" bleeder pillars had heaved and it was necessary to mine and load some of the heaved material and refuse to provide adequate roadway and space for roof supports preparatory to splitting pillar "X", according to plan; during the cleanup cycle, it was also necessary to load some of the loose coal along the front of the pillar to permit the miner to maneuver on the proper angle to mine split "A". After this preparatory cleanup cycle was completed, Bowman went to lunch and Eules Rhea, continuous miner helper, took the controls. The miner was trammed from the crosscut between the adjacent "X" and "Y" pillars for lubrication while the roadway and breaker timbers were set by Moses Salyers, roof bolter and timberman, and Edward Stanley, utilityman, who was relieving James Bradley (the victim), during his lunch period.

After Salyers and Stanley installed the necessary breaker and roadway timbers in the inby portion of the crosscut, Rhea trammed the miner into the place and started mining the "A" split in "X" pillar. Rhea mined and loaded 2 shuttle cars of coal, then maneuvered the miner to continue the loading cycle to establish the right rib of the "A" pillar split. Salyers and Stanley remained in the working area to prepare and install timbers, if needed, during the interval between shuttle car changes. After completion of his lunch period, Bowman, the miner operator, returned to the working area; and when he approached the conveyor end of the miner, proceeded to check and handle the miner cable while Rhea was maneuvering the miner preparatory to loading the third shuttle car. In the meantime, Bradley completed his lunch period and entered the working place to relieve Stanley, who left immediately for lunch. The third shuttle car was in the process of being loaded and was nearly loaded when the outburst occurred.

The locations of men and equipment and the extent of mining in the area at the time of the outburst are indicated in Sketch No. 2. The active area of 7 right, the extent of extraction and the cave line prior to and at the time of the occurrence, are indicated in Sketch No. 1.

The outburst was violent in nature but the stresses were confined principally to the "X" and "Y" bleeder pillars; however, a small amount of coal was shaken from the right rib of the pillar adjacent to the "X" bleeder pillar. The stress release was sufficiently intense to thrust the cutterhead end of the Lee-Norse miner a distance of 5 feet from its original position prior to the bump, as indicated in Sketch No. 2. The

coal expelled by the outburst left voids between the roof and coal, 2 to 8 inches in height at the locations along the ribs of the "X" and "Y" pillars, also illustrated in Sketch No. 2. The roof and floor in the vicinity of the outburst, insofar as could be determined, were not affected.

According to eyewitnesses, including Moses Salyers, he and James Bradley were positioned at the approximate locations indicated in Sketch No. 2 when the outburst occurred. It will be noted from Sketch No. 2, that Bradley, the victim, was near the rib of the outby pillar and opposite the cutting rotors of the miner and Salyers was about 8 feet in by the end of the miner. Salyers, Rhea, and Bowman stated that they heard Bradley shout or cry out shortly after the outburst. A dense cloud of dust was thrown into suspension and the safety hats and cap lamps of the three men were blown off their heads by the wind blast and it was some several seconds before they retrieved their lamps and were able to see. Salyers stated that his feet were fouled by timbers and coal, but when he regained visibility he could see Bradley lying face down across the right cutting ring or rotor of the miner. Bowman assisted in releasing Salyers and then they examined Bradley and concluded that he was dead.

The circuit breaker on the miner was opened by the shock from the stress wave and thus cut off the power from the machine; however, the inertia of the rotors caused them to revolve for a short period after the power was disconnected. During this short period of time, Bradley either was thrown onto or staggered into the bits of the decelerating rotor of the miner. He received extensive lacerations in the stomach and trunk regions which resulted in almost instantaneous death. Salyers received a small laceration on the right brow. Bowman was thrown off his feet and Rhea was shaken up, but otherwise they were uninjured. The section foreman, Willie Powers, who had been in the bleeder pillar place about 20 minutes prior to the bump, was near the belt-loading terminal when the bump occurred and cut the power off the equipment. Reportedly, methane was not detected during tests by officials several minutes after the bump. Damage to the equipment was not incurred.

Recovery operations were conducted and first-aid rendered to the injured under direction of W. B. Couch, general mine foreman, who arrived on the section within a short time and by the 7 right section personnel. Bradley was transported to the surface where he was examined and pronounced dead by a doctor. Salyers was treated and released.

The section foreman stated that he had not observed any unusual conditions prior to the outburst; however, an extensive fall occurred during the 12:00 a.m. - 8:00 a.m. shift in the area from which the previous 2 rows,

or a total of 10 pillars, had been extracted. This fall extended outward from the area where a dispositional change in roof structure (from a shales to thick sandstone) occurred 150 feet inby the current extraction line on the day of the outburst; however, from visual observations by the investigators, it was obvious that the fall was incomplete. The fall had terminated along the bleeder entry projection and cantilevered for 2 pillar lengths (150 feet) directly inby the pillar involved in the bump. This section of roof did not cave until after pillar "X" and two additional pillars were extracted on December 19. A factor that in all probability impeded caving of this section of roof resulted from unsuccessful attempts to mine the "C" wing of the second pillar 150 feet inby the "X" bleeder pillar (scene of accident) and of other pillar remnants observed at other locations within the specific area, as indicated in Sketch No. 1.

The bleeder pillars flanked by the mined-out 6 right panel, unquestionably, were prestressed by the abutment from this gob area; furthermore, the "X" and "Y" pillars were situated within a pillar-line point area subjected to reactions from converging abutments. The aspects of this bump also indicated there was most probably an imposition of a shock load upon the pillars by stresses from the span of thick cantilevering sandstone roof.

Considerable study and investigation have been given to the coal outburst problem at the Moss No. 2 Mine during 1967, and the present pillar extraction methods and procedures are good. Most coal outbursts can be attributed to improper mining methods and practices, but unquestionably, some are caused by physical conditions of the adjacent rocks and coal. In areas where dispositional changes in rock structure occur, the presence of faults, rolls, change in dip, and changes in the thickness, texture, and degree of hardness of the coal, particular attention must continue to be given to the selection of mining methods and practices that will afford the greatest factor of safety to the employees.

CAUSE OF ACCIDENT

This coal outburst is the result of an accumulative process, and factors believed to have contributed to the cause of the outburst include:

1. Natural conditions favorable to coal-pillar bursts, consisting of as much as 1,100 feet of cover, a thick sandstone formation that either contacted or was close to the coalbed, and a hard dense sandy siltstone floor material were present in the area involved.

2. The pillars involved, because of their size and shape, possessed considerable load-carrying capacity and their location with respect to gob areas formed a highly stressed pillar-line point area, a location where the greater percentage of coal outbursts occur.
3. Localized dispositional changes in the immediate roof structure from an interbedding of shales and shaley sandstone to thick sandstone were encountered about 150 feet inby the current extraction line.
4. The sandstone roof remained intact in the mined-out area for a distance of 150 feet inby the scene of the outburst. Previous to the outburst, 12 pillars were extracted before the roof caved in the mined-out area.
5. The company's rule prohibiting persons from entering and/or performing work in a pillar split in which mining operations with a continuous miner were being done, or entering and/or performing work in places immediately adjacent thereto, was not followed. The fact that the two timbermen, in violation of this rule, entered and performed work in the pillar place where the continuous miner was operating and in close proximity to the cutterhead of the machine contributed to the seriousness of this accident.
6. Pillar remnants formed "island abutments" in the gob that in all probability impeded the desired sharp caving close to the line of extraction.

RECOMMENDATIONS

Compliance with the following recommendations may prevent accidents of a similar nature:

1. In pillar recovery under hard, dense sandstone which resists caving, every precaution should continue to be taken to extract the coal pillars in a manner that will permit, insofar as practicable, orderly distribution of stresses (weight).
2. The company's rule prohibiting work or travel in the pillar places in which the continuous miner is operating or in pillar places immediately adjacent thereto, should be strictly complied with in areas vulnerable to coal outbursts by all concerned.
3. Complete extraction of pillars should be striven for and pillar remnants that can be mined safely should not be left in the gob to form "island abutments". Pillar remnants capable of considerable load-carrying capacities are likely to impede caving and therefore spontaneous failure is possible in a manner that could initiate a shock bump in the active pillar area.

The following recommendation has no bearing on this outburst accident; however, it is believed compliance will provide greater protection for the miner operators when exposed to the ribs of pillars vulnerable to coal bursts:

1. The protective shields provided for the continuous mining machine used in pillar mining areas vulnerable to outbursts should be used for the protection of the operators when they are exposed to ribs of highly stressed pillars.

ACKNOWLEDGMENT

The cooperation of employees, members of the United Mine Workers of America, company officials, and representatives of the Virginia Division of Mines and Quarries during this investigation is gratefully acknowledged.

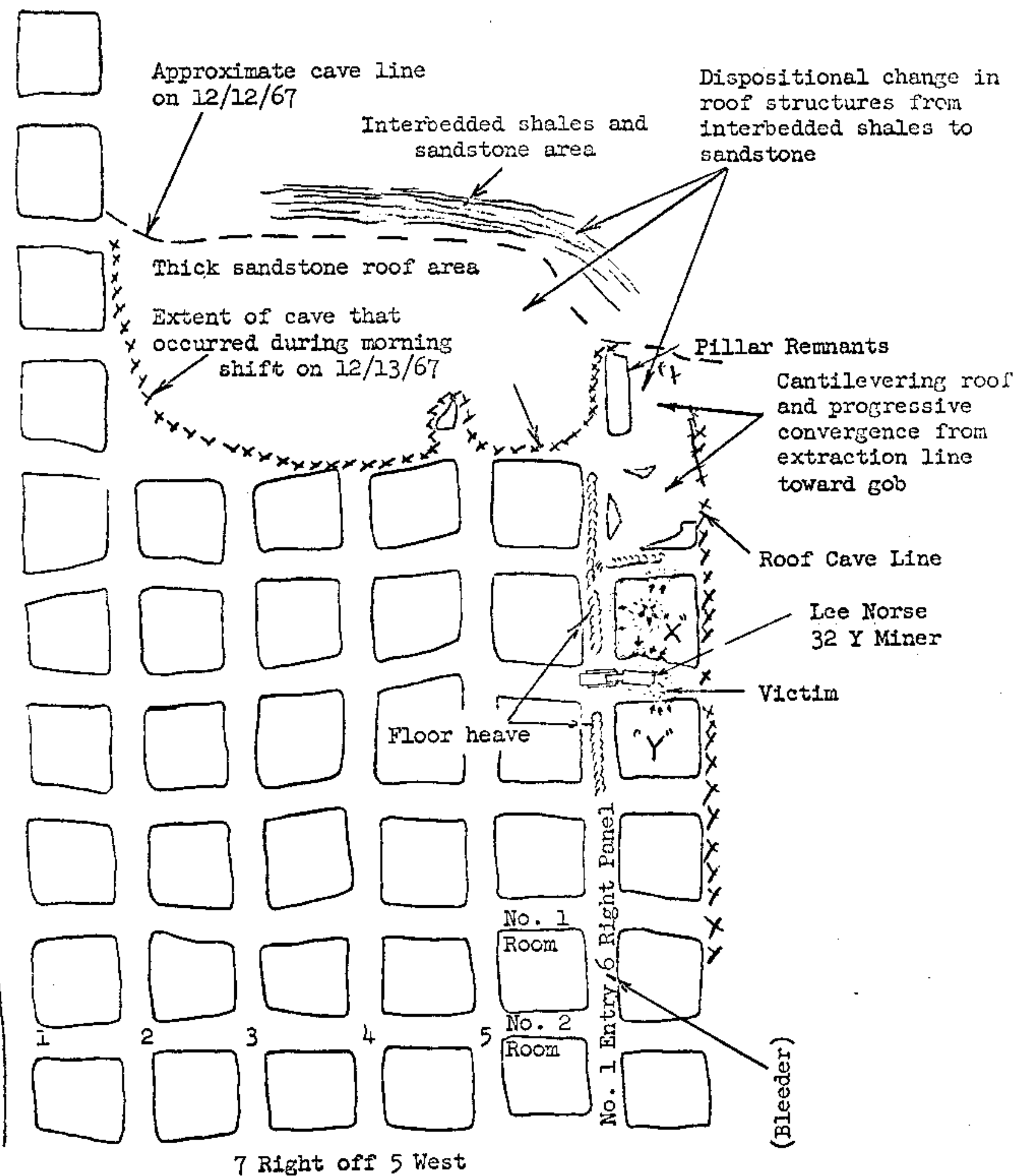
Respectfully submitted,

/s/ J. L. Gilley

J. L. Gilley
Mining Engineer

/s/ Jack E. Tisdale

Jack E. Tisdale
Technical Assistant



FATAL COAL MINE BUMP (OUTBURST) ACCIDENT
 MOSS NO. 2 MINE
 CLINCHFIELD COAL COMPANY
 CLINCHFIELD (P.O. DANTE), RUSSELL COUNTY, VIRGINIA

December 13, 1967

SCALE 1" = 100'

SKETCH NO. 1

5-2-2002
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